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GEO 443.01: Sedimentary Petrology

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Geosciences 443 – Sedimentary Petrology
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Introduction: The primary objective of the course is to develop skills in the characterization and analysis of sedimentary rock compositions, textures, and fabrics and the interpretation of physical, chemical, and biological influences on the sedimentary rock record. We will undertake analysis of sediment and sedimentary rock in outcrop, hand specimen and thin-section, and we will be introduced to various laboratory techniques for analyzing sedimentary rock compositions, textures and fabrics.

This class is designed to provide a platform for developing skills pertinent to the applied description and analysis of sedimentary rocks. You will have access to hundreds of rock and thin-section samples, and we will undertake three separate field trips in which we will collect some of the rocks we will study in the laboratory. Simply put, the more time you spend studying the rock materials presented in this class, the stronger your petrological skill set will become. Presently, there is a high demand for sedimentary petrologists, particularly in the energy industry. This class will provide you with the basic skills needed to work in this capacity.

The *tentative* course schedule and assigned readings are below:

Date	Lecture/lab topic	Assigned Reading
Aug. 26	Sedimentary textures Grain shape, sorting and size distribution	Boggs, Ch. 1 Boggs, Ch. 2 Farrell et al., 2012
Aug. 28	Siliciclastics overview: sedimentary transport and structures; Biogenic structures	Boggs, Ch. 3
Sept. 2	**NO CLASS – LABOR DAY**	
Sept. 4	Sed and biogenic structures, cont.; intro to siliciclastic conglomerates and sandstones ***Lab #1 assigned – sedimentary textures***	Boggs, Ch.6
Sept. 9	Siliciclastic sandstones, cont.; *work on lab 1 (grain size analyzer)*	
Sept. 11	Review of optical mineralogy; ***lab #2 assigned – Siliciclastic conglomerates and sandstones***	
Sept. 16	Continue discussion as needed; *work on labs 1 and 2*	
Sept. 18	***Lab #1 due*** Diagenesis of siliciclastic sandstones	Boggs, Ch.4, 5, & 8
Saturday, September 21	One-day field trip to Alberton Gorge; 7:30am-5:30pm	
Sept. 23	Diagenesis of siliciclastic sandstones, cont.	
Sept. 25	*Go over lab #1;* ***lab #2 due*** Chemical sedimentary rocks; ***lab #3 assigned – chemical and organic-rich sedimentary rocks***	
Sept.27-29	Full weekend field trip to Glacier Park and Rocky Mountain Front; leave 5pm Friday, return 9pm Sunday	
Sept. 30	Chemical sedimentary rocks; work on lab #3	Boggs, Ch.9
Oct. 2	Chemical sedimentary rocks, cont.	
Oct. 7	Organic-rich sedimentary rocks	

Oct. 9	Organic-rich sedimentary rocks, cont.; ***lab #3 due***	
Oct. 12	One-day field trip to Garnet Range; 7:30am-5:30pm	
Oct. 14	Mudrocks I: clay mineralogy; ***lab #4 assigned***	Boggs, Ch.13&14
Oct. 16	Clay mineralogy cont. XRD analysis	
Oct. 21	Mudrocks and XRD analysis, cont.; work on lab#4	
Oct. 23	Mudrocks and XRD, cont; work on lab#4	
Oct. 28	Mudrocks wrap-up; ***lab#4 due***	Boggs, Ch.7&9
Oct. 30	Review of class material to date	
Nov. 4	**MIDTERM EXAM - through mudrocks**	
Nov. 6	Limestones I: overview ***Lab #5 assigned - Carbonates I***	Boggs, Ch. 10
Nov. 11	**NO CLASS – VETERAN'S DAY HOLIDAY**	
Nov. 13	Limestones, cont. Work on lab#5	
Nov. 18	Limestones, cont. Work on lab#5	
Nov. 20	Dolomites; ***lab#5 due;*** ***lab#6 assigned – dolomites and evaporites***	
Nov. 25	Dolomites *Work on lab #6*	Boggs, Ch.11
Nov. 27	**NO CLASS – THANKSGIVING HOLIDAY** Evaporites *Work on lab #6*	
Dec. 2	Final student presentations	Boggs, Ch.12
Dec. 4	Final student presentations; ***lab#6 due***	
Dec. 11 (W)	**FINAL EXAM**; Friday, Dec. 13, 8:00-10:00am	

Field Trips:

We will take advantage of our location by undertaking three field trips this semester. The first field trip, Saturday, September 21 will involve analysis of middle Proterozoic and lower Paleozoic rocks west of Missoula, near Alberton. Our main field trip will take place the fourth weekend in September (Sept. 27-29) and will involve a traverse north to Glacier National Park, then east and south along the Rocky Mountain Front. Our final field trip will take place Saturday, October 12 and will involve a traverse through Paleozoic and Mesozoic rock of the Garnet Range east of Missoula. More information on each of these field trips will be forthcoming.

Class Projects:

In addition to regular labs, a midterm, and a final exam, this class will involve a semester-long student research group. You will be paired up with a partner and each partner-pair will be assigned a) two modern sand samples; b) two rock samples with accompanying polished thin-sections; and c) one stratigraphic formation or member that we will see in the field. Over the course of the semester, we will use the sand and rock samples as a platform for exploring several of the analytical tools available in the department, including a grain size analyzer, X-ray diffractometer, and scanning electron microscope (SEM) with cathode luminescence (CL) and energy dispersive spectroscopy (EDS) capabilities. In addition to using these tools to investigate your assigned sands and rock samples, you will be asked to develop a written industry-style report describing your results, and you will be asked to give a 15 minute oral presentation at the end of the semester summarizing these results. Each student pair also will be responsible for investigating one local stratigraphic formation or member, summarizing its attributes as published in the technical literature, and integrating this information with original observations and analyses from our field trips and follow-up laboratory

work on samples collected during those trips. Results of these investigations will be included in the final 'industry-style' report and oral summary.

Grading System:
This class includes 6 individual assigned labs that constitute the heart of the course material. Approximately every second week, a new lab will be assigned and the previous lab will be reviewed.

Final grades for this course will be based on the following: 1) 6 individual laboratory assignments (~30% of final grade); a term project with various items due at various times (~30% of final grade); a midterm exam (~20% of final grade); 4) a comprehensive final exam (~20% of final grade)

Penalty for late work:
Late assignments drag down the entire class and make it difficult to move forward with the material at a constant pace. Therefore, late assignments will not be accepted. Unexcused late assignments turned in after the due date at class time will not be graded and will automatically receive a zero.

Office Hours:
Commonly in a class of this nature, questions arise that require the input of the instructor in the laboratory. To this end, we will use some class time to work on laboratory assignments. All students are expected to use such time to work on the class labs and/or enhance their hand specimen identification and petrographic skills – class attendance at these 'lab sessions' is not optional. Hendrix will keep formal office hours from 12-1:30PM on Mondays and Wednesdays and is also available via appointment or ambush.

Reading:
Most of the reading for this class will come from the book *Petrology of Sedimentary Rocks* by Sam Boggs, Jr. This is an excellent guide to the composition and diagenesis of sedimentary rocks. I recommend you keep it at the end of the semester and make it part of your permanent library. In addition, some supplemental reading will be assigned as reading and other reference material will be available via the course web site throughout the semester.

Course Web Site:
Please be aware that all of the course content will be posted on moodle. Generally, I will post materials for each lecture about 24 hours ahead of the class meeting. Please feel free to download and/or print out the slides for each lecture and bring them to class as a starting point for taking notes.

An important note about academic misconduct:
All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at http://life.umt.edu/VPSA.